

WHAT IS CLAIMED IS:

5 1. A process for recycling a vapor-phase chemical comprising:  
introducing vapor-phase chemicals into a reactor with sufficiently supplied energy  
to cause a reaction in said reactor;  
exhausting gases from said reactor resulting from said reaction;  
separating a first gas from said exhausted gases;  
purifying said first gas; and thereafter  
10 introducing said first gas into said reactor.

2. The process of Claim 1, wherein said reaction comprises depositing a thin  
film layer on a substrate positioned in said reactor.

15 3. The process of Claim 1, wherein said first gas comprises H<sub>2</sub>.

4. The process of Claim 1, wherein said vapor-phase chemicals comprise H<sub>2</sub>.

20 5. The process of Claim 4, wherein said first gas comprises between 80% to  
90% of the quantity of said H<sub>2</sub> introduced in said reactor.

25 6. The process of Claim 1, wherein the sufficient supplied energy comprises  
an RF low frequency power energy level of between about 0.318 watts/cm<sup>2</sup> to about  
3.18 watts/cm<sup>2</sup>.

7. The process of Claim 1, wherein said reactor comprises a tapered outer  
shell surrounding a tapered susceptor.

30 8. A process for recycling a gas used in semiconductor processing  
applications, said process comprising:  
introducing H<sub>2</sub> into a semiconductor reactor;

exhausting at least a portion of said H<sub>2</sub> from said reactor;  
purifying said exhausted H<sub>2</sub>; and thereafter  
introducing said purified H<sub>2</sub> into said semiconductor reactor.

5           9.       The process of Claim 8, further comprising introducing vapor-phase  
chemicals into a reactor with sufficiently supplied energy to cause a reaction in  
said reactor.

10           10.       The process of Claim 8, wherein said purified H<sub>2</sub> comprises between 80%  
to 90% of the quantity of said H<sub>2</sub> introduced in said reactor.

15           11.       A system for recycling a vapor phase chemical, said system comprising:  
a reactor chamber capable of receiving and exhausting vapor-phase chemicals;  
a gas scrubber capable of receiving vapor-phase chemicals exhausted from said  
reactor chamber and outputting a first gas; and  
a gas purifier capable of purifying said first gas, said purified first gas being  
returnable to said reactor chamber.

20           12.       The system of Claim 11, wherein said reactor chamber is a  
PECVD reactor.

13.       The system of Claim 11, wherein said first gas comprises H<sub>2</sub>.

25           14.       The system of Claim 11, wherein said purified first gas comprises H<sub>2</sub>  
comprising between 80% to 90% of the quantity of said H<sub>2</sub> introduced in said reactor.

15.       The system of Claim 11, further comprising a pump for pumping said first  
gas through said system.

